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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,421	04/08/2004	Chih-Ho Chiu	250913-1190	7827

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EXAMINER	
JUBA JR, JOHN	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/820,421	CHIU ET AL.
	Examiner	Art Unit
	John Juba, Jr.	2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 08 April 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Oath/Declaration

The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:
Non-initialed and/or non-dated alterations have been made to the declaration (as to the date of execution). See 37 CFR 1.52(c).

Claim Objections

Claims 1 – 22 are objected to because of the following informalities. Appropriate correction is required:

Claims 1, 15, and 18 are objected to for the recitation of the dielectric protrusions as an array of "layers". While it is true that a ray of light passing parallel to the substrate encounters alternate layers of air and dielectric, the examiner believes that one of ordinary skill would regard the recited "dielectric layers" as a single patterned layer on the substrate. That is, Applicants' use of the expression layers is contrary to art-accepted nomenclature. Claims 2 – 14, 16, 17, and 19 – 22 are objected to for containing the same informality through their various dependencies from claims 1, 15, or 18.

Claim Rejections - 35 USC § 112

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 is incorrect in reciting a substrate thickness of 500 – 1500 nm. As disclosed, suitable substrate thicknesses range from 500 – 1500 μm.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3-21-05

Claims 1 – 3, 6 – 9, 12 – 18, 19, 20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhaoning Yu, et al (*Appl. Phys. Lett., 77(7)*), in view of Perkins, et al (U.S. Patent number 6,122,103). Referring to the discussion of Figure 1, Yu, et al disclose a single experiment in forming a wire grid polarizer with double metal layers, comprising the steps of:

providing a transparent substrate (silica);

forming an array of parallel and elongated dielectric layers (of PMMA) on the transparent substrate, wherein the dielectric layers have a period (190 nm) and a trench is located between adjacent dielectric layers;

forming a first metal layer ("Grating Mirror 2") having a first thickness (75 nm combined thickness of metal) in the trench; and

forming a second metal layer ("Grating Mirror 1") having a second thickness (75 nm combined thickness of metal) and a width (70 nm) on each dielectric layer, wherein the first and second metal layers are separated by a vertical distance of 125 nm [200 nm minus the 75 nm thickness of the first metal layer; it is clear from the present disclosure that the "vertical spacing" is measured between the top of the first metal layer and the bottom of the second metal layer];

wherein the period (190 nm) is in a range of 10 ~ 250 nm;

wherein the first thickness (75 nm) is in the range of 30 – 150 nm and is equal to the second thickness; and wherein the ratio of the width (70 nm) to the period (190 nm) is in the range of 25 ~ 75% (36.8%).

Thus, Yu, et al disclose the invention substantially as claimed. However, Yu, et al disclose a vertical spacing of 125 nm rather than 100 nm, as recited.

In the same field of endeavor, Perkins, et al disclose broadband wire grid structures. Perkins, et al disclose substrate material, metal thickness, pitch, and a width-to-period ratio as being variables that affect the polarizing performance of the structure (Col. 5, line 51 – Col 8, line 8). Among a range of metal thicknesses from 20 – 300 nm, Perkins, et al arrive at a preferred embodiment employing a 100 nm metal thickness.

Barring any *unexpectedly* improved result arising from a particular metal thickness, it appears that one of ordinary would have arrived at a 100 nm metal thickness (or more) in the polarizer of Yu, et al, through only routine experimentation and optimization, since Perkins, et al teach that metal thickness is a result-effective variable. In such a polarizer design, the vertical spacing between the first and second metal layers of Yu, et al would have been 100 nm (or less).

With regard to claim 12 and its dependent claims both references disclose a pitch in the recited range. Further, Perkins, et al discuss a transition region of grating designs wherein the polarization performance is prone to undesired excursions from the intended result. In order to avoid this region for any angle of incidence and any conventional substrate material, the pitch of the grating should be on the order of 0.19λ

(Col. 6, lines 29 – 48), where λ is the minimum wavelength to be observed (400 nm for the visible band). It would have been obvious to one of ordinary skill to one of ordinary skill to reduce the Yu, et al to less than 190 nm, in the interest of providing a grating design with good polarizing performance over a broad range of incident angles or with higher index substrates as suggested by Perkins, et al, or simply for operation at shorter wavelengths.

With regard to claims 2, 16, 19, and 22, Yu, et al disclose a dielectric layer thickness of 200 nm, and disclose the distance from the bottom of the first metal layer to the bottom of the second metal layer as being 200 nm. Thus, it is clear that the dielectric layer has been patterned (by nanoimprint, beginning with a lithographic step) all the way down to the substrate, such that the substrate is exposed (to the first metal layer) in the trenches.

With regard to claims 3, 17, and 20, Yu, et al do not disclose a remaining dielectric layer formed on the bottom of the trench. However, Perkins, et al teach that it may be desirable to have a layer of dielectric material in the trenches, and that that dielectric material may be the same as the material supporting the metal layers (see *e.g.,* discussion of Figures 9). Thus, barring any *unexpectedly* improved result arising from the provision of a dielectric material formed on the bottom of the trench, it appears that one of ordinary skill would have found it obvious to provide such a layer, as suggested by Perkins, et al.

Claims 4, 5, 10, 11, and 21, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu, et al and Perkins, et al, and further in view of Garvin, et al (U.S. Patent number 4,289,381). As set forth above for claims 1 and 18, Yu, et al and Perkins, et al disclose the invention substantially as claimed. However, these references do not disclose a particular substrate thickness (claims 4 – 5), and do not disclose a protective layer (claims 10-11, and 21).

In the same field of endeavor, Garvin, et al disclose a wire grid polarizer with double metal layers. Garvin, et al teach that the substrate should be chosen so as to be invisible (transparent) to the wavelengths of interest and of a thickness capable of supporting the overlying grid ("on the order of a few mils" for the substrate chosen), and further suggest a protective layer of "substrate material" atop the last metal layer for additional thermal mass and passivation of the upper layer.

With regard to claims 4 and 5, barring any *unexpectedly* improved result, it appears that one of ordinary skill would have arrived at a thickness in the range of 0.5 to 1.5 mm, through only routine experimentation and optimization, since Garvin, et al teach that selection of a substrate thickness is a matter of routine experimentation. With particular regard to claim 5, Perkins, et al suggest that glass is a suitable substrate for the visible range. Thus, one of ordinary skill would have found it obvious to substitute glass for the silica wafer of Yu, et al, since glass would have been cheaper than a high purity silica wafer.

With regard to claims 10, 11, and 21, it would have been obvious to one of ordinary skill to provide a protective layer of substrate material over the grating of Yu, et

al, in the interest of improving the thermal performance of the assembly through increased thermal mass, as fairly suggested by Garvin, et al, and in the interest of passivating the metal layers from oxidation that would degrade the polarizer performance, as fairly suggested by Garvin, et al. With particular regard to claim 11, the substrate material of Yu, et al is SiO2 (silica), however, it appears that selection of any of the recited materials would have been an obvious matter of selection a suitable material based upon it thermal characteristics, or transparency, as suggested by Garvin, et al.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wang, et al (U.S. Patent Appl. Pub. no. 2004/0201889 A1) disclose a wire grid polarizer with double metal layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (571) 272-2314. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn whose number is (571) 272-2312 and who can be reached on Mon.- Thu., 9 – 5.

The centralized fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for *all* communications.

JOHN JUBA, JR.
PRIMARY EXAMINER
Art Unit 2872

March 21, 2005